

TRANSVERSE COLON FOR CONTINENT URINARY DIVERSION: EXPERIMENTAL STUDY COMPARING TWO TECHNIQUES

Hypothesis / aims of study

Radiation therapy is a current treatment modality for some malignant neoplasm. Radiation therapy for cervix carcinoma favors the appearance of urologic complications such as actinic cystitis and urinary fistulas. The bladder function as a reservoir may be lost and these problems are surgically difficult to correct.

The small intestine and the ascending as well as descending colon suffer the damaging effects of radiation, particularly loss of vascularization and development of obliterating endoarthritis, which is the reason why they should not be used in creating urinary reservoirs because complications such as stricture of the stoma, enteroenteric fistulas and dehiscence of ureterointestinal anastomosis may occur.

The transverse colon does not suffer the damaging effects of pelvic radiation due to its high position in the abdomen. Moreover, it presents adequate blood supply for an appreciable extension, which allows ureterointestinal anastomosis using the antireflux technique.

Study design, materials and methods

This study was performed at the Laboratory of Experimental Surgery of Surgery Department. It received the approval of the Research Ethics Commission.

The study was composed of 16 dogs of both genders, weighing from 20 to 25 kg. A heterotopic reservoir was created with the transverse colon. The dogs were divided into three groups: Pilot Group composed of 6 dogs to standardize the technique. Group I was composed of five dogs. The Monti technique was used to construct the conduit and the Abol–Eneim technique to create continence. Group II was composed of five dogs and the intussusception technique was utilized for continence mechanism.

The animals were anesthetized with Thiopental in order to wash the reservoirs with saline solution, three times a week for 30 days to remove the intestinal mucus. The urodynamic study was performed and the reservoirs and conduits were removed for histological analysis. The animals were sacrificed according to the recommendations of the Research Ethics Commission

Group I:

A 2.5cm segment was isolated from the distal end of the 20cm colon segment, preserving the mesocolon. The segment was used to create the conduit according to the technique of Monti and the remaining 17.5cm to create the reservoir. The segment of the colon was detubularized and reshaped into a pouch, using Polyglycolic acid 3.0 running sutures.

During the creation of the Monti conduit, the detubularized intestinal segment of the colon formed a rectangular patch with the meso exactly in the middle. The tube was closed with 5.0 polydioxanone (PDS) running sutures over a 12Fr urethral catheter. This conduit was terminolaterally anastomosed with 5.0 PDS interrupted sutures.

The continence mechanism was constructed according to the technique described by Abol-Eneim. A 3cm segment of this conduit was partially buried with 3.0 PDS interrupted seromuscle sutures in the reservoir.

The other end of the Monti conduit was exposed in the abdominal wall. The skin stoma was sutured with 3.0 PDS. A zetaplasty technique was used to avoid stenosis of skin stoma.

Group II:

Of the 20cm isolated colon segment, 14 cm were detubularized. Intussusception was performed on 3cm of the 6cm long integral part of the isolated segment to create a valve according to Kock et al. principals modified by Ferreira et al. The remaining 3cm were used to create the conduit that was exposed through the skin. The 14cm detubularized segment was closed with continuous running sutures to form a pouch. The conduit was then exposed and sutured to the skin using the zetaplasty technique.

The reservoir in both groups was fixed to the abdominal wall to avoid pedicle torsion and vascular ischemia. The duration of the surgery using both techniques was registered.

Results

Duration of surgery in Group I ranged from 225 to 300 minutes, median of 257 and mean of 250 minutes. The operative time in Group II ranged from 180 to 230 minutes, median of 200 and mean of 205 minutes.

The mean reservoir capacity was 133ml in Group I and 53 in Group II. The comparison of variances between the groups with regard to reservoir capacity showed significant differences ($F=72.03$, $p=0.0011$). The Mann-Whitney test demonstrated that the measures obtained in Group I were significantly greater than those in Group II ($U=0$, $p=0.004$, $p_{\leq}0.01$). This finding was confirmed by the median test ($p=0.0238$). Regarding values of reservoir pressure at maximum capacity, the intragroup differences were not statistically different ($F=1.39$, $p=0.7572$). However, the mean pressure at maximum capacity was 95 cmH₂O in Group I and 19 cmH₂O in Group II, and the difference between the groups was statistically significant ($t=0.0001$; $U=0$, $p=0.004$; median test: $p=0.0039$). Mean reservoir compliance was 1.41 mL/cmH₂O in Group I and 2.78 mL/cmH₂O in Group II. Compliance measures were not statistically different ($F=3.40$, $p=0.2629$).

The mean transverse colon diameter was 4.0cm in Group I and 3.5cm in Group II. There was no significant difference of the transverse colon diameter between the groups. There was no difference in the intragroup variances regarding the length of the conduit ($F=9.50$, $p=0.3119$). However, the mean length of the conduit was 6.0cm in Group I and 1.5cm in Group II, and the difference was statistically significant ($t=0.005$; $U=0$, $p=0.004$; median test: $p=0.0396$)

Interpretation of results

The transverse colon made it possible to create a continent reservoir with a large capacity, low pressure and high compliance. The technique in Group I allowed creation of a reservoir with greater capacity. This was achieved by total detubularization and a longer portion was used in the confection of the reservoir. Other study found that the reservoir pressure was significantly less when the colon was totally detubularized, suggesting that total detubularization permits the creation of a reservoir so that all the vascularization that reaches the intestine is maintained intact, without compression, folds or bends, avoiding ischemia. With the technique used in Group II this is only partially achieved and an integral segment has to be maintained in order to perform intussusception. An additional

disadvantage is the fact that the intussusception occupies the space of the reservoir, reducing its capacity and surrounds the vascularization in the continence mechanism.

In Group II, the pressures vary from 10cm H₂O to 50cm H₂O due to the total or partial loss of the mechanism of continence observed in the three animals. The pressure of the reservoir at its maximum capacity was significantly greater in the dogs in Group I. This fact indicates that the mechanism of continence was more effective than the intussusception mechanism.

The Abol–Eneim technique, which consists of the mechanism of continence, allows greater leak pressure and volume in the reservoir. The utilization of only 2.5cm of the 20cm colon segment produces a conduit that is between 5.5cm and 8.0cm long and can be easily exteriorized. In cases where the overall thickness of the abdominal wall increases, an indication for Monti's conduit is very advantageous as the conduit is longer than in the other technique. The creation of a stoma is made easier by a long conduit. None of the surgeries performed on the dogs resulted in a short conduit because it always extended beyond the limit of the skin surface.

The final extension of 3.0cm of the conduit in Group II used to create a stoma was not long enough for exteriorization in some cases, due to the thickness of the abdominal wall, causing technical difficulties and representing a disadvantage in relation to Group I.

Loss of the intussusception verified by other authors varies between 16% to 41% and generally related to vascular events that may have been due to ischemia.

Concluding message

The results obtained lead to the conclusion that the mechanism of continence in Group I is more effective than in Group II. Both techniques are complex. Technique used in Group II presented an advantage in relation to duration of surgery. The length of the conduit is significantly greater in Group I and the ease for catheterization of the conduits is the same in both techniques.

<i>Specify source of funding or grant</i>	None
<i>Is this a clinical trial?</i>	No
<i>What were the subjects in the study?</i>	ANIMAL
<i>Were guidelines for care and use of laboratory animals followed or ethical committee approval obtained?</i>	Yes
<i>Name of ethics committee</i>	Ethical Commission of Animal Experimentation (CEEAA) – Biology Institute (IB) – UNICAMP